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10/532,313

11/14/2005

Jerome Assal

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05/30/2006

BUCHANAN INGERSOLL PC  
(INCLUDING BURNS, DOANE, SWECKER & MATHIS)  
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EXAMINER

JEFFERSON, QUOVAUNDA

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 05/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/532,313

Applicant(s)

ASSAL ET AL.

Examiner

Quovaunda Jefferson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/2005
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Objections***

Claim 5 is objected to because of the following informalities: Claim 5 recites the limitation "protection layer" in line 4, but a protection layer was never mentioned in claim

1. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 4, and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Matthews et al, US Patent 6,905,618.

Regarding claim 1, Matthews teaches a method for forming a stepped profile from a layer sequence in which, in a first patterning step, a first layer partial sequence **22** is removed apart from a first residual layer partial sequence **14** (Figure 2B), in a second patterning step, a second layer partial sequence **24** located below the first layer partial sequence **22** is partially removed by means of etching with a second etchant (Figure 3B), in a third patterning step, a third layer partial sequence **26** located below the second layer partial sequence **24** is partially removed by means of etching with a third etchant (Figure 3C and Figure 4) wherein, in the second patterning step, a region of the second layer partial sequence **24** that is located below the first residual layer partial sequence **26** is removed, a first projection of the residual layer partial sequence **26** being formed, and in the third patterning step, the first projection of the first residual layer partial sequence is removed (Note: the first projection of the first residual layer partial sequence was removed prior to the third patterning step).

Regarding claim 3, Matthews teaches wherein the first patterning step is carried out by means of etching with a first etchant (column 4, lines 36-38).

Regarding claim 4, Matthews teaches characterized-in that wherein a substantially identical chemical composition is chosen for the first etchant and for the third etchant (column 4, lines 36-38 and column 4, lines 64-67).

Regarding claim 9, Matthews teaches wherein prior to the first patterning step, a protective layer **30** is provided on the first layer partial sequence **14/22**.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews as applied to claim 1 above, and further in view of Sah, US Patent 6,297,161.

Regarding claim 2, Matthews fails to teach the second and third patterning steps are effected in aqueous solution. Sah teaches the second and third patterning steps are effected in aqueous solution. In particular, Sah teaches that multiples layers can be etched using wet-etching, specifically citing HNO<sub>3</sub> because the wet etching method has the advantage of lower equipment costs and a much better selectivity (column 1, lines 44-69).

Therefore, it would be obvious to use the teaching of Sah with that of Matthews because the wet etching method has the advantage of lower equipment costs and a much better selectivity (Sah, column 1, lines 44-46).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews as applied to claim 1 above, and further in view of Ohori et al, US Patent 6,156,662.

Regarding claim 5, Matthews fails to teach in the first patterning step, the first layer partial sequence is removed to an extent such that a second projection of the protective layer arises, which second projection has a length  $t_1$  greater than a thickness  $d_1$  of the first layer partial sequence. Ohori teaches in the first patterning step, the first layer partial sequence **46a** or **46b** is removed to an extent such that a second projection of the protective layer **48** arises, which second projection has a length  $t_1$  greater than a thickness  $d_1$  of the first layer partial sequence because barrier types patterns undergo certain recessions when as a result of using a wet etching process. (To further clarify, the dimensions of  $t_1$  and  $d_1$  for the Ohori, Figure 11 are the same as the dimensions that the applicant has specified in Figures 1 and 2. Therefore  $t_1$  for Ohori is the length between the end of the protective layer **48** to the sidewall of **46a** or **46b** and  $d_1$  is the thickness of **46a** or **46b**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ohori with that of Matthews because barrier types patterns undergo certain recessions when as a result of using a wet etching process (Ohori, column 10, lines 24-25).

Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews as applied to claim 1 above, and further in view of Wood et al, US Patent 3,663,184 .

Regarding claim 6, Matthew fails to the first layer partial sequence substantially comprises Ag, the second layer partial sequence substantially comprises Ni, and the third layer partial sequence substantially comprises Ti. Wood teaches the first layer partial sequence **20** substantially comprises Ag, the second layer partial sequence **16** substantially comprises Ni, and the third layer partial sequence **15** substantially comprises Ti because a pedestal for a solder bump pad could be formed with the three metal layers (column 3, line 42, column 4, lines 7, and column 4, line 41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wood with that of Matthews because a pedestal for a solder bump pad could be formed with the three metal layers (column 3, line 42, column 4, lines 7, and column 4, line 41).

Regarding claim 7, Matthews fails to teach an aqueous solution of nitric acid, preferably in a dilution ratio of 1:z where  $2.0 < z < 8.0$ , is used as the second etchant. Wood teaches an aqueous solution of nitric acid is used as the second etchant because nitric acid can be used to etch a nickel layer (column 4, lines 7-9).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wood with that of Matthews because nitric acid can be used to etch a nickel layer (Wood, column 4, lines 7-9).

However, Matthews and Woods fail to teach a nitric acid in a dilution ratio of 1:z where  $2.0 < z < 8.0$ . However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).



Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews as applied to claim 1 above, and further in view of Wang et al, US Patent 5,160,492.

Regarding claim 8, Matthews fails to teach a mixture of hydrogen peroxide, ammonium hydroxide and water, preferably in a volume ratio of approximately 1:x:y, is used as the first and third etchants, where  $0.5 < x < 2.0$  and  $4.0 < y < 10.0$ . Wang teaches a mixture of hydrogen peroxide, ammonium hydroxide and water is used as the first and third etchants preferably in a volume ratio of approximately 1:x:y because the combination of hydrogen peroxide, ammonium hydroxide and water yield a strong etch (to further clarify, Wang teaches that a wet etch, using a mixture of hydrogen peroxide,

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ammonium hydroxide and water, can be used to etch semiconductor layers and is well-known in the art. Therefore, this type of etch can be used to the structure as taught by Matthews. See column 5, line 3).

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wang with that of Woods because the combination of hydrogen peroxide, ammonium hydroxide and water yield a strong etch (Wood, column 5, line 3).

However, Matthews and Wang fail to teach a mixture of hydrogen peroxide, ammonium hydroxide and water, preferably in a volume ratio of approximately 1:x: y, where  $0.5 < x < 2.0$  and  $4.0 < y < 10.0$ . However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

### ***Conclusion***

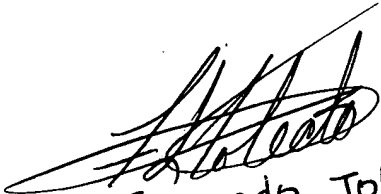
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quovaunda Jefferson whose telephone number is 571-272-5051. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

QV

  
Fernando Toledo  
Art unit 2823  
Patent Examiner